

Taxonomy of Two Subtribes, Mesomyaria and Acontiarina (Anthozoa, Actiniaria) in Korea

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ABSTRACT

The mesomyarian and acontiarian actiniaria in Korean waters are identified into 11 species, 11 genera and 8 families. Among them, the following five species are newly recorded to Korean fauna: *Isanthus capensis* Carlgren; *Actinostola carlgreni* Wassilieff; *Stomphia coccinea* (Muller); *Parasicyonis actinostoloides* (Wassilieff); and *Metridium senile* (Linnaeus). They are redescribed in detail with figures, and the others are examined and discussed.

Key words: taxonomy, Actiniaria, Mesomyaria, Acontiarina, Korea

INTRODUCTION

The subtribes Mesomyaria and Acontiarina are two of three subtribes belonging to the tribe Thenaria, which is characterized by a rounded or flat base with well-developed basilar muscles. Although the taxonomic studies of Korean actinarians have been continued since early 1980s (Song 1984, 1992, 1998), only six species of the subtribe Acontiarina were already reported and the fauna of the subtribe Mesomyaria have not been studied so far. The purpose of this study is to investigate the fauna of subtribes Mesomyaria and Acontiarina (Cnidaria; Zoantharia; Anthozoa; Actiniaria; Nynantheae; Mesomyaria and Acontiarina) within Korean waters.

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MATERIALS AND METHODS

For this systematic study of subtribes Mesomyaria and Acontiarina, specimens stocked during the period from 1968 to 1997 and new ones collected from 1998 to 2000 were examined. They were obtained at the coasts from low tide to sublittoral zone of 31 localities of Korean waters by skin and SCUBA diving and fishing nets (Fig. 1). Samples were narcotized with menthol or magnesium chloride and preserved in 5% formalin solution. They were deposited in the Department of Biological Science and the Natural History Museum, Ewha Womans University.

The identification of specimens was done by the observation of external features and internal

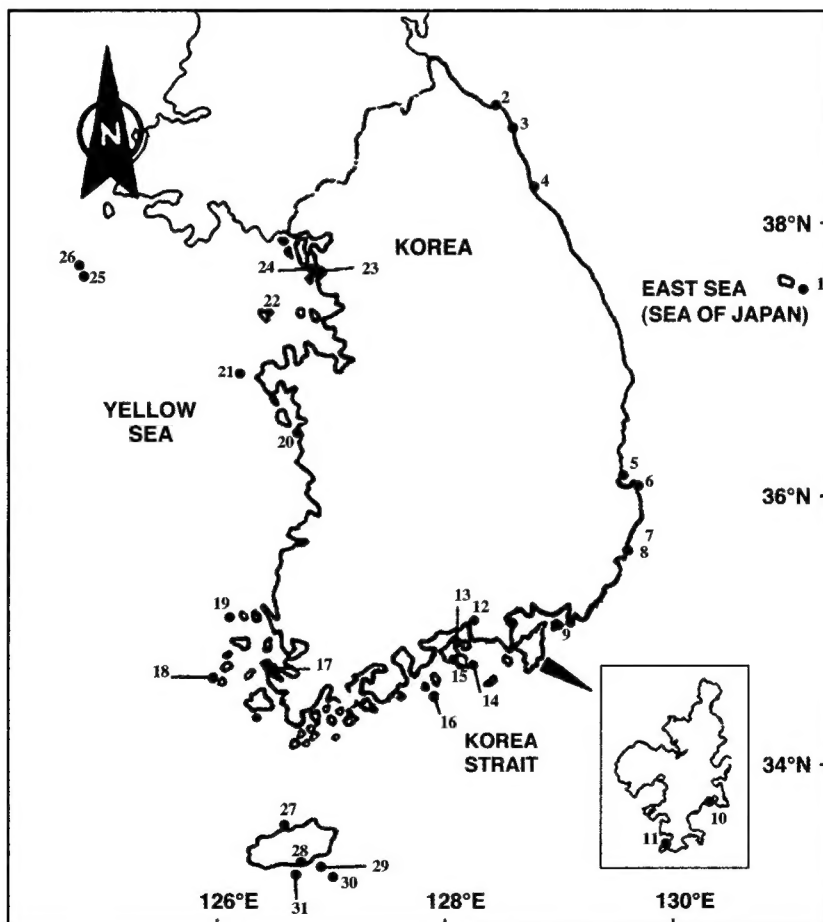


Fig. 1. A map showing the sampling sites of mesomyarians and acontiarins.

1, Dokdo; 2, Geojin; 3, Chuksan; 4, Sokcho; 5, Pohang; 6, Guryongpo; 7, Dangsa; 8, Mipo; 9, Gadeokdo; 10, Gujora; 11, Gabae; 12, Samcheonpo; 13, Changseon; 14, Jodo; 15, Sangju; 16, Ando; 17, Hwawon; 18, Uido; 19, Jaewon; 20, Boryeong; 21, Anheung; 22, Deokjeokdo; 23, Jakyakdo; 24, Yeongjongdo; 25, Socheongdo; 26, Daecheongdo; 27, Jejuhang; 28, Seogwipo; 29, Seopseom; 30, Jigwido; 31, Beomseom.

characters under microscope systems (Stemi SV VI and Zeiss Axioscop 2 microscope system, Zeiss Inc.). Internal characters of specimens were facilitated by the dissection to observe the arrangement of internal structures and the microtome serial section using tissue processing systems (Reichert-Jung).

To see the size and distribution of cnidae, they were examined and measured with an ocular micrometer at 1000 magnification of photo microscopes (Zeiss Axioscop 2 microscope system and Olympus BH2) by squashing a bit of tissue on a drop of phenol-glycerol solution. For the classification, we basically followed Carlgren's systematic scheme (1942, 1949).

RESULTS

Phylum Cnidaria Hatschek, 1888 자포동물문
 Class Anthozoa Ehrenberg, 1834 산호충綱
 Subclass Zoantharia de Blainville, 1830 말미잘亞綱
 Order Actiniaria R. Hertwig, 1882 해변말미잘目
 Suborder Nynantheae Carlgren, 1899 니난트亞目
 Tribe Thenaria Carlgren, 1899 족만族
 Subtribe Mesomyaria Stephenson, 1921 중근亞族 (신칭)
 Thenaria without acontia. Sphincter mesogloal.

Key to the families of Mesomyaria

1. Mesenteries divided into macrocnemes and microcnemes Isanthidae
- Mesenteries not divided into macrocnemes and microcnemes Actinostolidae

Family Isanthidae Carlgren, 1938 유사말미잘科 (신칭)

Mesomyaria with well developed mesogloal sphincter. Mesenteries divided into macrocnemes and microcnemes. Retractors of mesenteries very strong, strongly restricted (reniform) to almost circumscribed. No acontia.

Genus *Isanthus* Carlgren, 1938 유사말미잘屬 (신칭)

Isanthidae with cylindrical, elongate body. Column smooth without any kind of projections. Margin distinct. Sphincter mesogloal, not strong. Tentacles hexamerously arranged, their longitudinal muscles ectodermal, as radial muscles of oral disc. Two siphonoglyphs and two pairs of directives. six pairs of perfect mesenteries, with kidney-shaped retractors, outer mesenteries microcnemes. No more mesenteries proximally than distally.

*1. *Isanthus capensis* Carlgren, 1938 유사말미잘 (신칭) (Pl. I, A-B; Figs. 2-3)

Isanthus capensis Carlgren, 1938, p. 59, fig. 23-25; 1949, p. 76; Hand, 1955a, p. 87; Fautin, 1982, p. 698.

Material examined. 3 inds., Changseon, 25 Nov. 1999, H. R. Cha and H. S. Lim; many inds., Samcheonpo, 24 Nov. 1999, H. R. Cha and H. S. Lim, intertidal zone.

Description. This species with cylindrical and elongate body attached to rocks and macro-

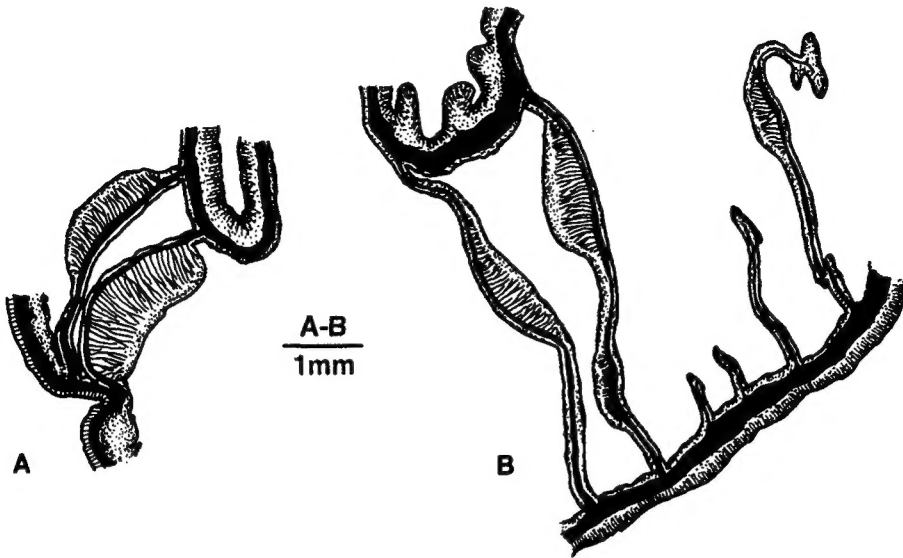


Fig. 2. Mesenteries of *Isanthus capensis*. A, directive; B, 1st, 2nd and 3rd mesenteries.

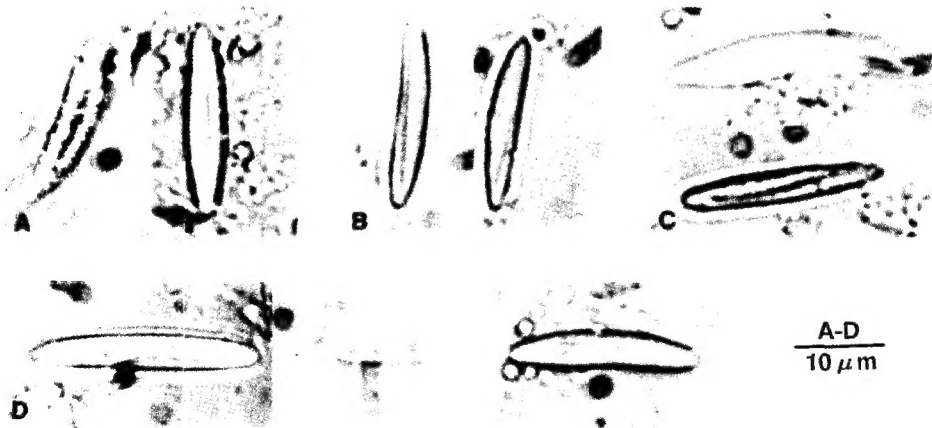


Fig. 3. Cnidae of *Isanthus capensis*. A, tentacle; B, actinopharynx; C, column; D, mesenteries.

seaweeds in intertidal zone. In expanded specimens, 4-12 mm long and 4-8 mm wide. In contracted specimen, column 3-7 mm long and pedal disc 3-10 mm wide. Column not divided into scapus and scapulus, smooth without any kind of outgrowths. Margin distinct. Actinopharynx deeply wrinkled and long furrowed.

Sphincter mesogloal, short, and strongly developed. Tentacles 48 (6+6+12+24), hexamerously arranged four rings. Tentacles of ordinary length, conical and pale-brownish transverse bands. Base of tentacles ectodermal longitudinal muscles. Two distinct siphonoglyphs and two pairs of directives. six pairs of perfect mesenteries with well-developed retractors and weak parieto-basilar muscle. Mesenteries of 2nd and 3rd cycles with weak retractor muscle. Retractor muscle

circumscribed-diffuse. No acontia.

Cnidae: spirocyst, basitrichs, microbasic b-mastigophors and microbasic p-mastigophors

Distribution and size (μm) of cnidae are as follows:

Tentacles	Spirocyst	18.5-22.5 \times 2.0-3.2
	Basitrichs	27.8-35.5 \times 2.7-4.5
Actinopharynx	Basitrichs	20.5-28.8 \times 3.0-3.8
	Spirocyst (rare)	19.0-23.0 \times 2.5-3.4
Column	Spirocyst	20.5-22.8 \times 2.3-3.0
	Basitrichs	25.8-32.5 \times 2.5-4.0
	Microbasic b-mastigophors	28.0-34.8 \times 3.2-4.2
Mesenteric filament	Basitrichs	25.8-36.0 \times 3.0-3.8
	Microbasic p-mastigophors	42.8-56.8 \times 4.8-5.2

Coloration. Column colorless; Tentacles colorless and their base brownish sepia-colored mark.

Table 1. Comparison of size (mm) in relation to state of specimens.

Parts	Expanded		Contracted	
	Length	Width	Length	Width
Column	4-12	4-8	3-7	3-10
Tentacle	2-3	0.5-1		
Oral disc		3-7		
Pedal disc		3-8		3-10

Habitat. Small individuals usually adhere to rocks and macro-seaweeds in shallow water.

Distribution. Korea (Korea Strait), California, South Africa.

Family Actinostolidae Calgren, 1932 빛말미잘과 (신칭)

Mesomyaria whose the column is commonly smooth, rarely tuberculate or papillae but without verrucae and other hollow outgrowths. Sphincter mesogloal. Mesenteries not divided into macrocnemes and microcnemes. Retractor diffuse, rarely circumscribed. No acontia.

Key to the genera of Actinostolidae

1. Mesenteries distinctly arranged according to the *Actinostola*-rule 2
Mesenteries indistinctly arranged according to the *Actinostola*-rule *Parasicyonis*
2. Sphincter weak *Actinostola*
Sphincter strong *Stomphia*

Genus *Actinostola* Verrill, 1883 빛말미잘屬 (신칭)

Actinostolidae with body sometimes short, cup-like or long, cylindrical. Column usually thick, firm, slightly rugose or almost smooth, or with flat tubercles produced by mesogloal thickenings. Sphincter comparatively weak, mesogloal, so that upper part of column cannot perfectly cover

tentacles. Tentacles short, inner ones considerably longer than outer ones. Longitudinal muscles of tentacles and radial muscles of oral disc mesogloal. Two siphonoglyphs. Numerous perfect mesenteries hexamerously arranged. Retractor of mesenteries diffuse, parieto-basilar and basilar muscle strong. Mesenteries of two first cycles sterile.

***2. *Actinostola carlgreni* Wassilieff, 1908 빛말미잘 (신칭) (Pl. I, E-G; Figs. 4, 5)**

Actinostola carlgreni Wassilieff, 1908 p. 28, pl. 2, fig. 26; pl. 8, fig. 82-83; Uchida, 1941, pp. 388-389, fig. 4; Carlgren, 1949, p. 78.

Catadioneme carlgreni Stephenson, 1920. p. 558.

Material examined. 1 ind., Chuksan, 24 May 1976, J. I. Song; 8 inds., Chuksan, 22 Dec. 1977, B. J. Rho; 2 inds., Chuksan, 23 Dec. 1977, B. J. Rho; 1 ind., Guryongpo, 25 Nov. 1983, J. I. Song; 2 inds., Guryongpo, 22 Jul. 1986, J. I. Song; 2 inds., Sokcho, 2 Aug. 1991, J. I. Song, by fishing nets.

Description. *Actinostola* with body long and cylindrical. Specimens 43-62 mm long, pedal disc 26-35 mm and oral disc 34-43 mm wide. Largest one 62 mm long, pedal disc 32 mm and oral disc 38 mm wide. Everted actinopharynx well developed and deeply furrowed. Column usually thick and slightly rugose or smooth. Sphincter weak and mesogloal, so that upper part of column cannot perfectly cover tentacles. Tentacles not fully contracted at upper part of column. Tentacles short and blunt tips, inner tentacles a bit longer than outer ones. Tentacles up to 139 (6+6+12+24+48) with mesogloal longitudinal muscles arranged hexamerously. Numerous perfect mesenteries, hexamerously arranged. Two developed siphonoglyphs and directives. Actinopharynx

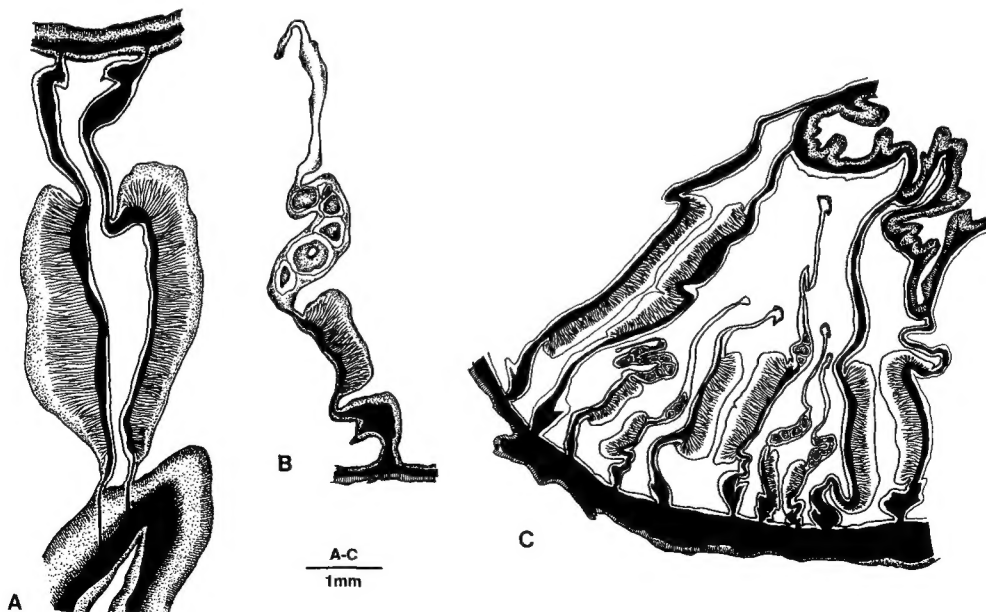


Fig. 4. Mesenteries of *Actinostola carlgreni*. A, directive; B, 2nd mesentery; C, 1st, 2nd and 3rd mesenteries.

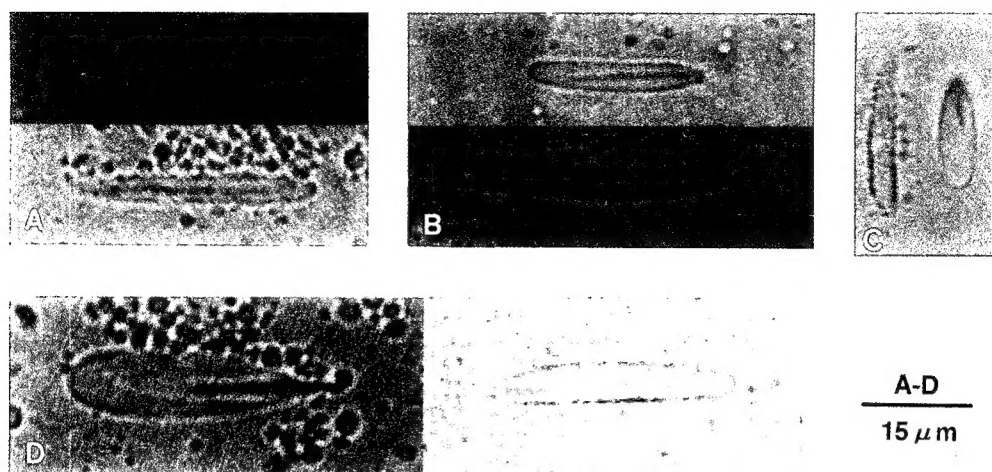


Fig. 5. Cnidae of *Actinostola carlgreni*. A, tentacle; B, actinopharynx; C, column; D, mesenteries.

well developed and deeply furrowed. Second cycle of mesenteries sterile. Retractors of mesenteries diffuse and parieto-basilar and basilar muscle strong. No acontia.

Cnidae: spirocyst, basitrichs, microbasic p- mastigophors and microbasic b-mastigophrs.

Distribution and size (μm) of cnidae are as follows:

Tentacles	Spirocyst	19.0–45.0 \times 2.5–6.0
	Basitrichs	21.0–24.0 \times 3.0–4.0, 44.0–48.5 \times 4.8–6.0
	Microbasic b-mastigophors	36.0–44.0 \times 7.0–9.0, 46.0–49.6 \times 6.0–7.0
	Microbasic p-mastigophors	25.0–32.5 \times 2.8–3.8
Actinopharynx	Spirocyst	32.5–52.5 \times 2.5–6.0
	Basitrichs	20.5–32.0 \times 2.5–4.0
	Microbasic p-mastigophors	29.0–33.0 \times 5.0–6.0
Column	Spirocyst	20.0–32.5 \times 2.5–6.0
	Basitrichs	19.0–29.0 \times 3.0–4.0
	Microbasic p-mastigophors	18.5–21.0 \times 2.0–2.8
Mesenteric filaments	Basitrichs	22.5–28.5 \times 2.5–3.8

Table 2. Comparison of size (mm) in relation to state of specimens.

Parts	State	Expanded	
		Length	Width
Column		28–62	28–53
Tentacle		9–16	2–4
Oral disc			27–53
Pedal disc			13–35

Microbasic p-mastigophors 21.0-44.8 3.5-7.0

Coloration. Column, tentacles and oral disc all pinkish white in formalin. In life, column white and tentacles and oral part red.

Habitat. This species attached stones and rocks. It usually present offshore 8-250 m in depths. This specimen contains zooxanthellae in its tentacles.

Distribution. Korea (East Sea), Japan (Honshu, Onaga Bay, Sagami Bay).

Genus *Stomphia* Gosse, 1839 풍선말미잘屬 (신칭)

Actinostoliidae with broad base. Column smooth, variable in thickness, margin tentaculate. Sphincter mesogloea strong. Tentacles short, conical, fairly numerous. Two well developed siphonoglyphs. Perfect mesenteries generally sterile, at least stronger imperfect mesenteries fertile. Considerably more mesenteries at base than at margin. Mesenteries of younger imperfect cycles unequally developed in size. Retractor diffuse, well developed, parieto-basilar and basilar muscles strong.

***3. *Stomphia coccinea* (Muller, 1776) 풍선말미잘 (신칭)**

(Pl. I, C, D; Figs. 6, 7)

Actinia coccinea Muller, 1776, p. 231.



Fig. 6. Mesenteries of *Stomphia coccinea*. A, directive; B, 1st and 2nd mesenteries.

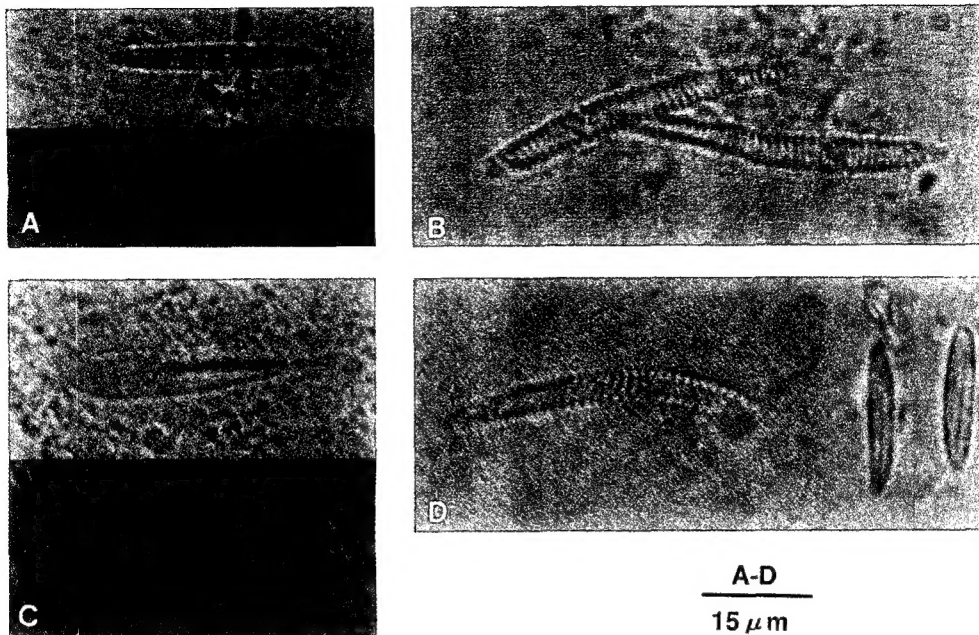


Fig. 7. Cnidae of *Stomphia coccinea*. A, tentacle; B, actinopharynx; C, column; D, mesenteries.

Stomphia coccinea: Stephenson, 1935, p. 382, pl. 15, fig. 7; pl. 21, fig. 8; Uchida, 1941, p. 390, fig. 5; Carlgren, 1949, p. 79; Manuel, 1988, p. 120; Shick, 1991, p. 127; Cairns *et al.*, 1991, p. 41.

Material examined. 1 ind., Sokcho, 25 Apr. 1976, J. I. Song; 4 inds., Chuksan, 24 May 1976, J. I. Song and S. J. Yun; 2 inds., Chuksan, 23 Dec. 1977, B. J. Rho; 13 inds., Chuksan, 23 Dec. 1977, B. J. Rho, C. J. Sim and S. Shin; 1 ind., Guryongpo, 12 Jul. 1981, J. I. Song; 2 inds., Guryongpo, 12 Jul. 1984, J. I. Song; Guryongpo, 22 Jul. 1986, J. I. Song and S. J. Yun; 7 inds., Sokcho, 2 Oct. 1990, J. I. Song, by fishing nets.

Description. Base broad, usually wider than thick. Column variable in shape, typically taper inwards from limbus. In contracted states, it forms a hemisphere of firm consistency, 48–75 mm long and pedal disc 51–65 mm wide. In expanded states, column 62–85 mm in height and pedal disc 43–60 mm in width. Column smooth and thick without any outgrowths. Margin distinct with tentacles. Tentacles and pairs of mesenteries frequently arranged 6, 12, 16, 32–36 and 16–18 pairs perfect. Tentacles short and conical shape and inner cycles, 15–18 mm long, longer than outer ones, 7–12 mm long. Longitudinal muscles of tentacles mesogloal to ecto-mesogloal. Sphincter mesogloal and strong. Two well developed siphonoglyphs. Among mesenteries 18 pairs perfect. Perfect mesenteries generally sterile. At distal part, imperfect mesenteries fertile. Considerably more mesenteries at base than at margin. Retractor diffuse and well developed, parieto-basilar and basilar muscles strong.

Cnidae: spirocyst, basitrichs, microbasic b- and p-mastigophors.

Distribution and size (μm) of cnidae are as follows:

Tentacles	Spirocyst	31.0-36.5 × 2.5-5.0
	Basitrichs	28.0-34.5 × 3.4-3.8
	Microbasic b-mastigophors	42.0-52.0 × 6.5-7.0
Actinopharynx	Spirocyst	33.5-36.5 × 2.5-3.0
	Microbasic b-mastigophors	46.0-47.0 × 6.0-7.0
	Microbasic p-mastigophors	24.0-27.0 × 6.0-7.0
	Basitrichs	22.5-29.0 × 2.5-3.0
Column	Spirocyst	28.0-32.5 × 2.0-3.2
	Basitrichs	18.5-23.0 × 2.2-2.8
	Basitrichs	32.5-57.0 × 3.0-4.0
	Microbasic p-mastigophors (very rare)	26.0 × 6.0
Mesenteric filaments	Microbasic p-mastigophors	38.0-45.8 × 3.8-7.0
	Spirocyst	22.0-54.0 × 3.0-6.0
	Basitrichs (rare)	14.0-22.0 × 2.5-3.0

Coloration. In life, tentacles orange, actinopharynx dark red, column and pedal disc orange with red marks.

Table 3. Comparison of size (mm) in relation to state of specimens.

State Parts	Expanded		Contracted	
	Length	Width	Length	Width
Column	62-85	38-56	14-75	
Tentacle	10-18	2-3		
Oral disc		19-20		
Pedal disc		43-60		51-65

Habitat. This species usually attached to stones or shells of molluscs at offshore downwards to 250 m in depth.

Distribution. Korea (East Sea), Japan (Onagawa Bay, Hokkaido).

Genus *Parasicyonis* Carlgren, 1921 호리병말미잘屬 (신칭)

Actinostolidae with well developed pedal disc. Body usually broader than long. Column thick, smooth, without tubercles. Margin tentaculate. Tentacles rather short, robust, wrinkled in contracted state, inner ones longer than outer. Sphincter mesogloal, rather weak, so that column commonly does not wholly cover tentacles. Longitudinal muscles of tentacles and radial muscles of oral disc mesogloal. Two deep siphonoglyphs. Numerous perfect mesenteries. Only mesenteries of last cycle fertile. Retractor diffuse, rather weak.

***4. *Parasicyonis actinostoloides* (Wassilieff, 1908) 호리병말미잘 (신칭)**

(Pl. I, H-J; Figs. 8, 9)

Cymbactis actinostoloides Wassilieff, 1908 p. 25, pl. 2, fig. 24; pl. 7, fig. 74-75; Stephenson,

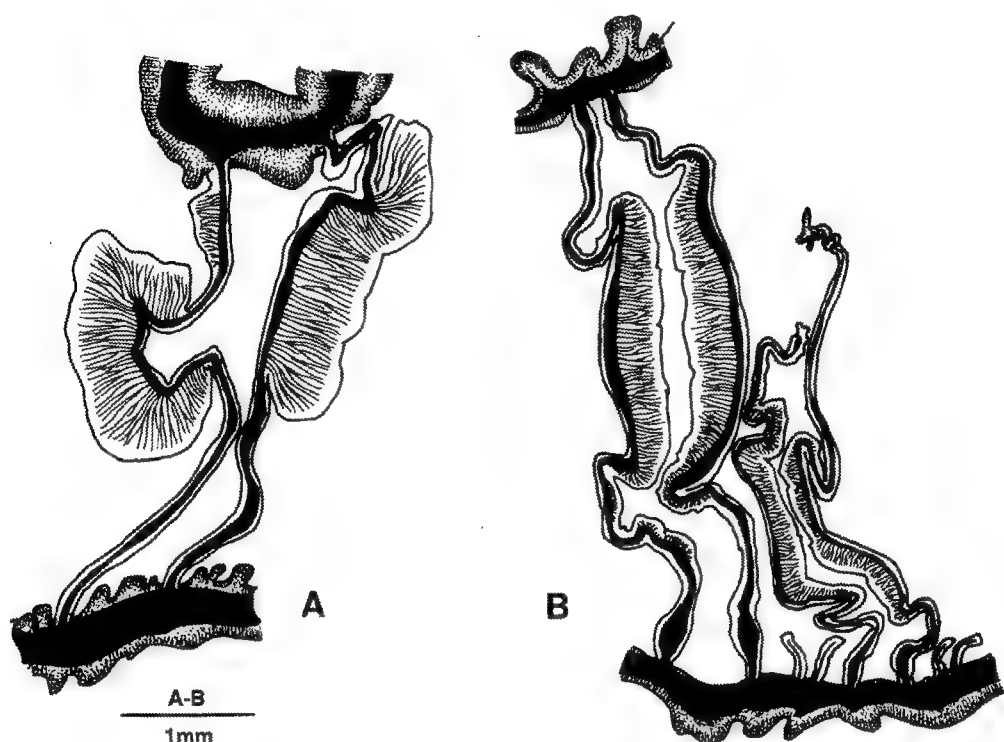


Fig. 8. Mesenteries of *Parascyonis actinostoloides*. A, directive; B, 1st, 2nd and 3rd mesenteries.

1920, p. 553.

Parascyonis actinostoloides: Carlgren, 1921, p. 208; 1949, p. 80.

Material examined. 6 inds., Seogwipo, 18 Jan. 1985, J. E. Seo and J. I. Song; 3 inds., Seogwipo, 12 Jul. 1985, J. I. Song; 4 inds., Seogwipo, 12 Jul. 1985, by SCUBA diving.

Description. Body broader than long. Column smooth, firm and thick. Specimens column 35–85 mm long, oral disc 43–85 mm wide and pedal disc 32–75 mm wide. Their size variation widely observed. Greatest specimens 85 mm in height, oral disc 82 mm and pedal disc 72 mm in width. Smallest specimens column 35 mm high, oral disc 46 mm and pedal disc 32 mm wide. In preserved state, longitudinally and transversally wrinkled. Margin tentaculate. Oral disc very wide and well-developed two siphonoglyphs. About one half of oral disc devoid of tentacles. Number of tentacles up to 112. Tentacles thick, conical and tip of tentacles bulbing in living state. Sphincter mesogloal, weak, so that column commonly does not wholly cover the tentacles. Number of mesenteries very numerous. Number of mesenteries about twice as many as number of tentacles. Last cycle of mesenteries fertile. Retractor diffuse, weak.

Cnidae: spirocyst, basitrichs, microbasic p-mastigophors, microbasic amatigophors.

Distribution and size (μm) of cnidae are as follows:

Tentacle	Spirocyst	25.5–29.5 \times 2.5–3.5
	Basitrichs	21.5–24.5 \times 2.0–2.5
Actinopharynx	Basitrichs	22.0–23.5 \times 2.0–3.5

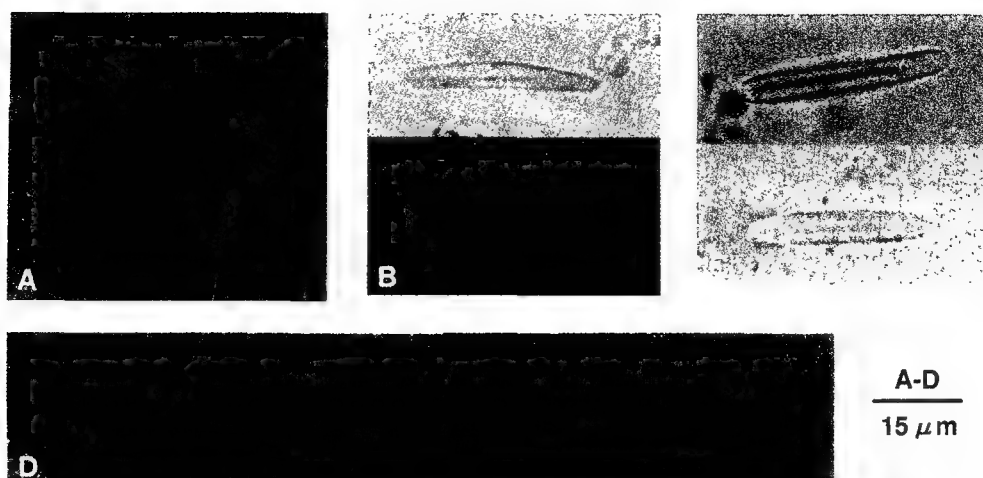


Fig. 9. Cnidae of *Parascyonis actinostoloides*. A, tentacle; B, actinopharynx; C, column; D, mesenteries.

	Microbasic p-mastigophors	21.5-25.5 × 3.2-4.8
Column	Basitrichs	17.0-24.5 × 2.0-2.5
Mesenteric filaments	Microbasic p-mastigophors	48.5-56.5 × 4.0-4.8
	Microbasic amastigophors	58.5-62.0 × 3.5-4.2

Coloration. In life, column grayish green and orange in base, tentacles and oral disc green, tips of tentacles purple or green.

Table 4. Comparison of size (mm) in relation to state of specimens.

Parts	State	Expanded	
		Length	Width
Column		18-85	
Tentacle		3-17	2-4
Oral disc			43-85
Pedal disc			32-75

Habitat. In Korean waters, this species restrictedly occurred at the southern most location of Cheju Island. Usually they lived on rocks downwards from 5 m to 30 m in depth. This species have lots of endosymbionts, zooxanthellae in endoderm and sea-spiders in coelenteron.

Distribution. Korea (southern part of Cheju Is.), Japan (Sagami Bay).

Subtribe Acontiarina Carlgren in Stephenson, 1935 螫刺亞族

Thenaria with acontia or acontia-like organs.

Key to the families of Acontiarina

1. Typical acontia with very numerous nematocyst 2
 Acontia-like organs containing only few nematocyst Nemanthidae
2. Mesenteries divided into macro- and microcnemes Isophelliidae
 Mesenteries not divided into macro- and microcnemes 3
3. Mesogloal sphincter 4
 No sphincter Haliplanellidae
4. Acontia with basitrichs only Hormathiidae
 Acontia with more than two kinds of nematocyst 5
5. Acontia with basitrichs and microbasic amastigophors Sagartiidae
 Acontia with microbasic b-mastigophors and microbasic amasghors Metridiidae

Family Hormathiidae Carlgren, 1925 끈말미잘목

Acontiaria with strong mesogloal sphincter. Mesenteries not divisible into macro- and microcnemes. Usually six pairs of perfect mesenteries. Perfect mesenteries usually sterile. Acontia basitrichs only.

Key to the genera of Hormathiidae

1. Column divided into scapus and scapulus *Hormathia*
 Column not divided into scapus and scapulus *Calliactis*

Genus *Hormathia* Gosse, 1859 끈말미잘屬

Hormathiidae with well developed base which is often attached to shells. Column divisible into scapus and scapulus. Sphincter mesogloal, strong. Two well developed siphonoglyphs.

5. *Hormathia andersoni* Haddon, 1888 고동끈말미잘

Previous records in Korea. Mipo, 23 May 1982, J. I. Song; Uhak, 5 Aug. 1983, J. I. Song; Uhak, 6 Aug. 1983, J. I. Song; Mipo, 26 Nov. 1983, J. I. Song; Mipo, 27 Nov. 1983, J. I. Song; Mipo, 12 Jan. 1984, H. S. Han; Samcheonpo, 22 Jul. 1984, B. J. Rho and C. J. Shim; Mipo, 27 Dec. 1986, J. I. Song; Sangju, 26 Apr. 1990, B. J. Rho and J. W. Lee, by fishing nets of shrimps; Song, 1998.

Material examined. many inds., Sangju, Aug. 1974, B. J. Rho; many inds., Mipo, 8 Dec. 1981, Lee, Yang, Huh and Seo; many inds., Mipo, 8 Dec. 1981, Lee, Yang, Huh and Seo; many inds., Mipo, 26 Mar. 1994, J. I. Song and J. H. Won.

Habitat. This species attached to shells of gastropods and bivalvia.

Distribution. Korea (East Sea, Korea Strait), Viet Nam, Cambodia and Pulo Condore.

Genus *Calliactis* Verrill, 1869 집게말미잘屬

Hormathiidae with well developed base. Column smooth and not divisible into scapus and scapulus. Cinclides present and sphincter mesogloal. Retractor of mesenteries fairly weak, diffuse. Often commensal with hermit crabs.

6. *Calliactis japonica* Carlgren, 1928 집게말미잘

Previous records in Korea. 5 inds., Seogwipo, 1 Dec. 1978; 5 inds., Cheongsando, 25 July 1981; 6 ind., Samcheonpo, 21 July 1982; 6 inds., Chujado, 100 m deep, 6-8 Feb. 1986; 2 inds., Seogwipo, 60-90 m deep, 9 Oct. 1986; 3 inds., Ssanggeun, 7 m deep, 8 July 1996; 6 inds., Bijindo, 9 July 1996; 2 inds., Susan, 29 Jan. 1997; 3 inds., Chejudo, 25 May 1998 (Song, 1998).

Habitat. This species often commensals with hermit crabs, *Dardanus arrosor*. Three individuals of the anemones commonly adhere to gastropod shell, *Tonna luteostoma* accompanying a single hermit crab.

Distribution. Korea (Korea strait, Cheju Is.), Japan (Sagami, Misaki, Isoto Is.).

Family Metridiidae (Carlgren, 1893) 섬유세닐말미잘과

Acontia whose acontia are provided with microbasic b-mastigophors and microbasic amastigophors, latter sometimes very rare or absent in adult. Sphincter mesogoeal. Mesenteries not divisible into macrocnemes and microcnemes.

Genus *Metridium* Oken, 1815 섬유세닐말미잘屬

Metridiidae with well developed base. Column divided into scapus and capitulum with a parapet and fosse. Cinclides scattered below collar. Tentacles short, numerous, their longitudinal muscles ectodermal. Siphonoglyphs variable in number, usually one or two. Perfect mesenteries very variable in number, typically six pairs but often more. Six primary pairs sterile in typical individuals. Retractors diffuse, sometimes short and broad in section. Sphincter mesogloeal. Acontia well developed, their cnidae microbasic b-mastigophors and microbasic amastigophors.

*7. *Metridium senile* (Linnaeus, 1767) 섬유세닐말미잘 (Pl. I, K-M; Figs. 10, 11)

Actinia senile Linnaeus, 1767, p. 1088.

Metridium senile fimbriatum Verrill, 1865, p. 150.

Metridium senile var. *fimbriatum* Carlgren, 1934; Uchida, 1938, p. 314, pl. 11, fig.5; 1941, p. 387; 1941, p. 273.

Metridium senile Stephenson, 1935 p. 214; Carlgren, 1949 p. 106; Hand, 1955b, p. 192; Manuel, 1988, p. 139, fig. 48A-C; Shick, 1991, p. 47; Cairns *et al.*, 1991, p. 43.

Material examined. 4 inds., Pohang, 25 Jul. 1968; 5 inds., Geojin, 25 Jul. 1968, B. J. Rho and S. Shin; 9 inds., Chuksan, 25 May 1976, J. I. Song and S. J. Yun; 3 inds., Chuksan, 23 Dec. 1977, B. J. Rho; 3 ind., Pohang, 24 Jul. 1978, B. J. Rho; 2 inds., Mipo, 2 Dec. 1981, Lee, Yang, Huh and Seo; 3 inds., Jukdo, 13 Jul. 1982, SNU; 1 ind., Guryongpo, 25 Nov. 1983, J. I. Song; 1 ind., Hupo, 11 Oct. 1986, S. J. Yun; 5 inds., Sokcho, 2 Oct. 1990, J. I. Song; 4 inds., Sokcho, 3 Oct. 1990, J. I. Song; 6 inds., Sokcho, 2 Aug. 1991, J. I. Song; 2 inds., Dangsa, 4 Feb. 1996, J. I. Song; 1 ind., Onsan, 30 Jun. 1997, J. I. Song; many inds., Sokcho, 2-5 Aug. 1997, J. I. Song; 10 ind., Sokcho, 27-28 Sept. 1997, J. I. Song; 2 inds., Dangsa, 10 Jan. 1998, by fishing nets.

Description. Metridiidae with well developed base. Body variable in shape, sometimes more higher than wide, with voluminous disc and well-expanded base. Contracted specimens 25-58 mm long and 28-55 mm in diameter of pedal disc. Expanded specimens very variable in size, 32-102

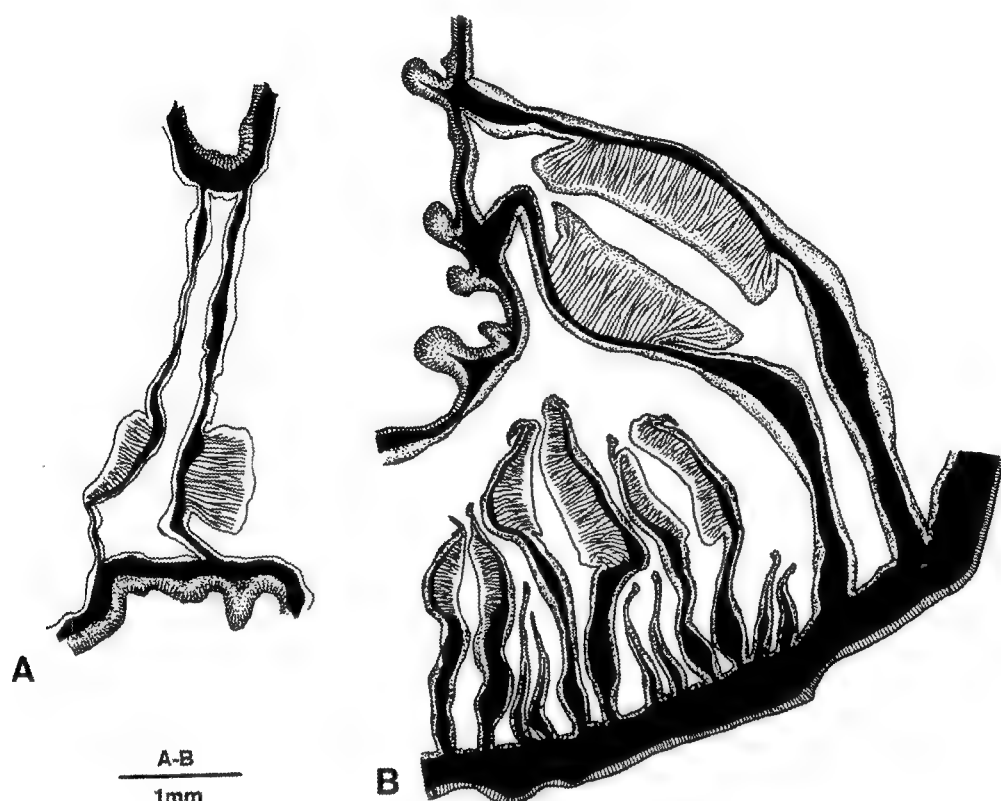


Fig. 10. Mesenteries of *Metridium senile*. A, directive; B, 1st, 2nd, 3rd and 4th mesenteries.

mm long and 22–68 mm wide of pedal disc. Largest specimens 102 mm long and pedal disc 54 mm wide. Column divided into smooth scapus and extensive capitulum with a parapet and fosse. Cinclides inconspicuous to naked eye, scattered on scapus. Oral disc circular in young, but deeply and conspicuously lobed in adult. Two siphonoglyphs. Tentacles short, numerous, slender, covered capitulum. Mesenteries hexamerously arranged up to 6th cycles. Perfect mesenteries variable in number, typically 12 pairs. Sphincter mesogloeal. Retractor muscle diffuse and strong, with basilar and parieto-basilar muscle strong. Acontia well developed. Mesogloea in body wall thick.

Cnidae: spirocyst, basitrichs, microbasic b- and p-mastigophors.

Distribution and size (μm) of cnidae are as follows:

Tentacle	Spirocyst	21.0–24.5 \times 2.5–4.0
	Basitrichs	21.0–25.0 \times 2.2–3.0
	Microbasic b-mastigophors	23.0–24.0 \times 3.5–4.0
Actinopharynx	Spirocyst	25.5–28.0 \times 2.5–3.0
	Basitrichs	32.5–36.0 \times 2.2–3.0
Mesenteric filament	Basitrichs	31.5–33.5 \times 2.2–2.5
	Microbasic p-mastigophors	14.8–16.8 \times 3.5–4.0, 27.0–42.5 \times 4.0–6.0

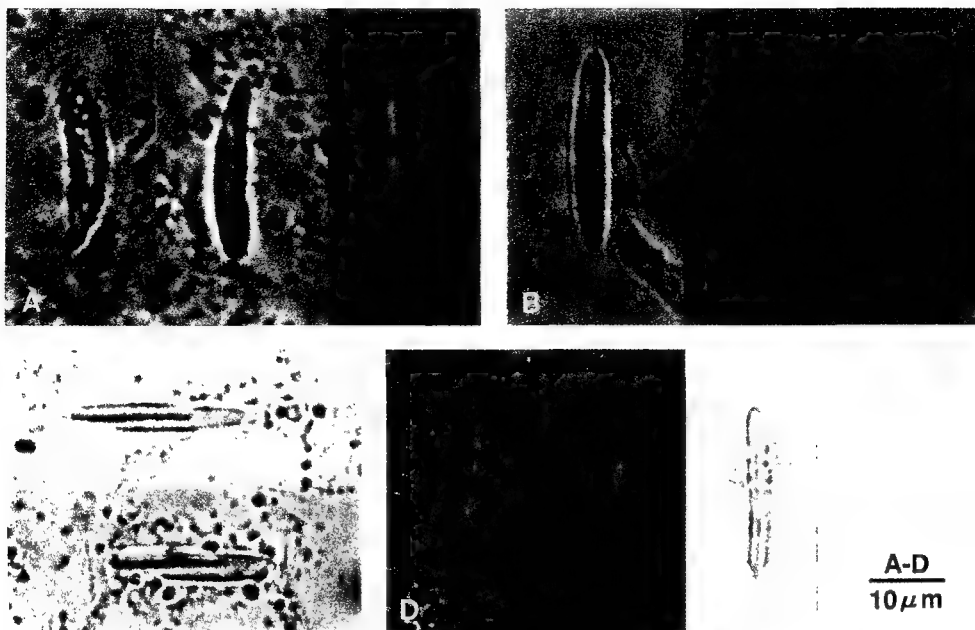


Fig. 11. Cnidae of *Metridium senile*. A, tentacle; B, actinopharynx; C, mesenteries; D, acontia.

Acontia	Microbasic b-mastigophors	36.8-62.0 × 3.0-4.0
	Microbasic p-mastigophors	14.0-30.0 × 3.0-5.0,
		61.0-73.0 × 6.0-7.0

Coloration. Variable, commonly pale brown red and milky white in living and yellowish pink in formalin.

Table 5. Comparison of size (mm) in relation to state of specimens.

Parts \ State	Expanded		Contracted	
	Length	Width	Length	Width
Column	25-94	20-64	19-66	
Tentacle	4-13			
Oral disc		19-71		
Pedal disc		22-68		23-55

Habitat. This species are attached to rocks and shells of bivalves and gastropods (*Tonna* sp.).

Distribution. Korea (East Sea), Japan (Kurile Is. Hokkaido and the northern parts of Honshu), Pacific coasts of North America (Puget Sound and Nanaimo) through Alaska, Kamchatka and Bering Sea to Hokkaido (Nemuro), Boreal, circumpolar, low water-100 m.

Remarks. In terms of a reference (Shick, 1991), this species is highly valuable for biochemical and neurobiological researches to understand characters of sea anemones. This species shows variable

patterns for asexual and sexual reproductions (Bathom and Pantin, 1951; Bucklin, 1987a, 1987b).

Family Haliplanellidae Hand, 1955 줄말미잘과

Acontiaria with no sphincter. Acontia with basitrichs, microbasic amastigophors and microbasic p-mastigophors. Mesenteries not divisible into macro- and microcnemes.

Genus *Haliplanella* Hand, 1955 줄말미잘屬

Haliplanellidae with a distinct pedal disc. Column smooth, divisible into scapus and capitulum. Cinclides present on scapus. Sphincter absent. Margin of capitulum tentaculate.

8. *Haliplanella luciae* (Verrill, 1989) 담황줄말미잘

Previous records in Korea. Narodo, 23 Jul. 1982; Jakyakdo, 28 Apr. 1983; Jakyakdo, 14 May 1983; Sorido, 6 Aug. 1983; Jakyakdo, 18 Apr. 1984; Sinsudo, 21 Jul. 1984; Nugdo, 22 Jul. 1984; Anmyundo, 11 Aug. 1984; Hongdo, 25 Aug. 1984; Anheung, 27 Oct. 1984; Samcheonpo, Nov. 1984; Seochon, 8 Jul. 1985; Wonsando, 8 Jul. 1986; Maldo, 10 Jul. 1986; Seogwipo, 12 Jul. 1985; Jakyakdo, 4 Oct. 1986; Anmyundo, 14 May 1988; Jangseungpo, 19 Jul. 1989; Haegumgang, 20 Jul. 1989; Jakyakdo, 30 Sep. 1989; Yangpyung, 27 Apr. 1990, intertidal zone (Song, 1984, 1992, 1998).

Material examined. many inds., Yeongjongdo, 23 Sep. 1967; many inds., Jakyakdo, 12 May 1979, many inds., Seogwipo, 12 Jul. 1985, J. I. Song; many inds., Jakyakdo, 26 Sep. 1991; many inds., Jakyak-do, May 1998; many inds., Sangju, 29 Jun. 1998, Y. J. Lee and H. R. Cha; 6 inds., Sangju, 30 Jun. 1998, Y. J. Lee and H. R. Cha; 5 inds., Jodo, 1 Jul. 1998, Y. J. Lee and H. R. Cha; 5 inds., Socheongdo, 30 Aug. 1998, H. R. Cha and H. S. Lim; 5 inds., Uido, Aug. 1998, J. I. Song and Y. J. Lee; many inds., Dukdong, 12 Nov. 1998, Y. J. Lee and H. R. Cha; 3 inds., Boryeong, 17 Apr. 1999, J. I. Song and H. R. Cha; 8 inds., Anheung, 18 Apr. 1999, J. I. Song and H. R. Cha; 7 inds., Dokdo, May 1999, Y. J. Lee; 5 inds., Gabae, 28 Jul. 1999, J. I. Song and H. R. Cha; 5 inds., Daecheongdo, 31 Aug. 1999, H. R. Cha and H. S. Lim; 7 inds., Gujora, 28 Sep. 1999, J. I. Song and H. R. Cha; 6 inds., Changseondo, 24 Nov. 1999, H. R. Cha; 5 inds., Gadeokdo, 22 Apr. 2000, H. R. Cha and H. S. Lim; 3 inds., Hwawon, 4 Aug. 2000, J. I. Song, H. R. Cha and H. S. Lim; 4 inds., Jaewon, 4 Aug. 2000, J. I. Song, H. R. Cha and H. S. Lim; 4 inds., Ando, 1 Sep. 2000, H. R. Cha and H. S. Lim.

Distribution. Korea (East Sea, Yellow Sea, Korea Strait, Cheju Is. area), Cosmopolitan.

Family Nemanthidae Carlgren, 1940 담홍말미잘과

Acontiaria with mesogloal sphincter. Acontia-like organs attached at termination of filaments and not forming any distinct batteries of nematocysts.

Genus *Nemanthus* Carlgren, 1940 담홍말미잘屬

Nemanthidae with wide pedal disc, smooth column and long tentacles. Sphincter mesogloal, well-developed. Actinopharynx with distinct, broad syphonoglyphs. Perfect pairs of mesenteries 6-12. Retractor weak.

9. *Nemanthus nitidus* Wassilieff, 1908 담홍말미잘

Previous records in Korea. Seogwipo, Hongdo, Gigwido, Gujora, Munseom (Song, 1998).

Material examined. 7 inds., Seogwipo, 10 Jul. 1965, B. J. Rho; many inds., Seogwipo, 13 Dec. 1969, B. J. Rho; 6 inds., Mipo, 7 Aug. 1970, 5 inds., Jigwiseom, 9 Feb. 1971, B. J. Rho; 3 inds., Beomseom, 7 Feb. 1971, B. J. Rho; 5 inds., Seopseom, 15 Apr. 1975, J. I. Song and B. J. Rho; 8 inds., Seogwipo, 13 Apr. 1975, B. J. Rho and J. I. Song; many inds., Seogwipo, 14 Apr. 1975, B. J. Rho and J. I. Song; 5 inds., Jejuhang, 21 Jun. 1985, B. J. Rho, Seo and Choi; many inds., Munseom, 22 Jan. 1998, J. I. Song; 12 inds., Beomseom, 3 Nov. 2000, J. I. Song, by SCUBA diving and fishing nets.

Distribution. Korea (Korea Strait, Cheju Is. area), Japan (Sagami Bay, Bonin Is., Port Lloyd).

Family Sagartiidae (Gosse, 1858) 사가트말미잘과

Acontiarina with mesogloal sphincter. Mesenteries not differentiated into macro- and microcnemes. Acontia with microbasic amastigophors and basitrichs.

Genus *Verrillactis* 손말미잘屬

Sagartiidae with well-developed base. Column smooth, not divisible into regions. Sphincter mesogloal. Tentacles in several cycles, never long. Two siphonoglyphs and two directives. 12 pairs of mesenteries perfect and sterile. Acontia well developed.

10. *Verrillactis paguri* (Verrill, 1869) 집게손말미잘

Previous Records in Korea. Uhak, 6 Aug. 1983; Mipo, 27 Nov. 1983; Geojedo, 19 Jul. 1989; Sangju, 26 Apr. 1990; Ssanggeun, 8 Jul. 1996; Susan, 29 Jan. 1997; Heungnam, 3 Jul. 1997, intertidal zone-40 m deep (Song, 1998).

Distribution. Korea (Korea Strait), Japan, China Sea, Wakanoura Kii.

Family Isophelliidae Stephenson, 1935 유사돌말미잘과

Acontiarina with mesogloal sphincter. Mesenteries divided into macro- and microcnemes. Acontia with basitrichs and microbasic amastigophors.

Genus *Flosmaris* Stephenson, 1920 꽃골풀말미잘屬

Isopheliidae with elongate column divisible into scapus and scapulus. Cinclides probably absent. Margin tentaculate. 12 pairs of macrocnemes bearing gonads, filaments and strongly restricted retractors, all perfect. Acontia present.

11. *Flosmaris mutsuensis* (Uchida, 1938) 꽃골풀말미잘

Previous Records in Korea. Mipo, 27 Dec. 1986, J. I. Song (Song, 1992).

Material examined. Deokjeokdo, 1 Jul. 1982, J. I. Song; Jakyakdo, 28 Sep. 1991, J. I. Song; Jakyakdo, 26 Sep. 1992, J. I. Song, intertidal zone.

Distribution. Korea (Yellow Sea and Korea Strait), Japan (Mutsu Bay off Urata between Futago and Oshima).

Table 6. Distribution of Korean actinurians according to regions and habitat.

Species	Regions				Habitat	
	East Sea	Korea Strait	Yellow Sea	Cheju Is. area	Intertidal	Subtidal
* <i>Isanthus capensis</i>		+			○	
* <i>Actinostola carlgreni</i>	+					○ (15-90 m deep)
* <i>Stomphia japonica</i>	+					○ (15-90 m deep)
* <i>Parascyonis actinostoloides</i>				+		○ (5-30 m deep)
<i>Hormathia andersoni</i>	+	+				○ (15-90 m deep)
<i>Calliactis japonica</i>		+		+		○ (7-100 m deep)
* <i>Metridium senile</i>	+					○ (15-30 m deep)
<i>Haliplanella luciae</i>	+	+	+	+	○	
<i>Nemanthus nitidus</i>		+		+		○ (10-30 m deep)
<i>Verrillactis paguri</i>	+	+			○	○ (40 m deep)
<i>Flosmaria mutsuensis</i>	+		+		○	○ (90 m deep)
Total	7	6	2	4	4	9

*: The actinurian species newly recorded in the present study.

DISCUSSION

In this study, we reevaluate the distribution and diversity of Korean actinurians with 11 species belong to subtribes Mesomyaria and Acontiaria examined. The distribution of Korean actinurians in terms of four regions of Korean waters is shown at Table 6. It is showed that seven species including newly recorded three species are occurred along the East Sea. Remaining three regions, Korea Strait, Yellow Sea and Cheju Is. area, respectively comprised six species, two species and four species.

Those 11 species can be divided by habitat difference into intertidal zone or subtidal zone, based on the depth of the water (Table 6). Two species including one species of Mesomyaria, *Isanthus capensis* and one of Acontiaria, *Haliplanella luciae*, are found from intertidal zone only. On the other hand, seven species are found at variable depth in subtidal zone. Among them, *Actinostola carlgreni*, *Stomphia corricea*, *Calliactis japonica* and *Hormathia andersoni* were collected downwards to 100m deep by fishing net as abyssal species. Moreover, the distribution of *Verrillactis paguri* and *Flosmaria mutsuensis* suggest that these species occurred at wide vertical range from intertidal to subtidal. One species, *Haliplanella luciae* is note worthy as a cosmopolitan species occurring along the coastal line of Korea.

ACKNOWLEDGMENTS

This research was supported by the MOST through National Research Program (2000) for

Women's University (No. 00-B-WB-06-A-06).

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RECEIVED: 23 March 2001

ACCEPTED: 13 April 2001

EXPLANATION OF PLATE I

Plate I (scale bars = 1 cm)

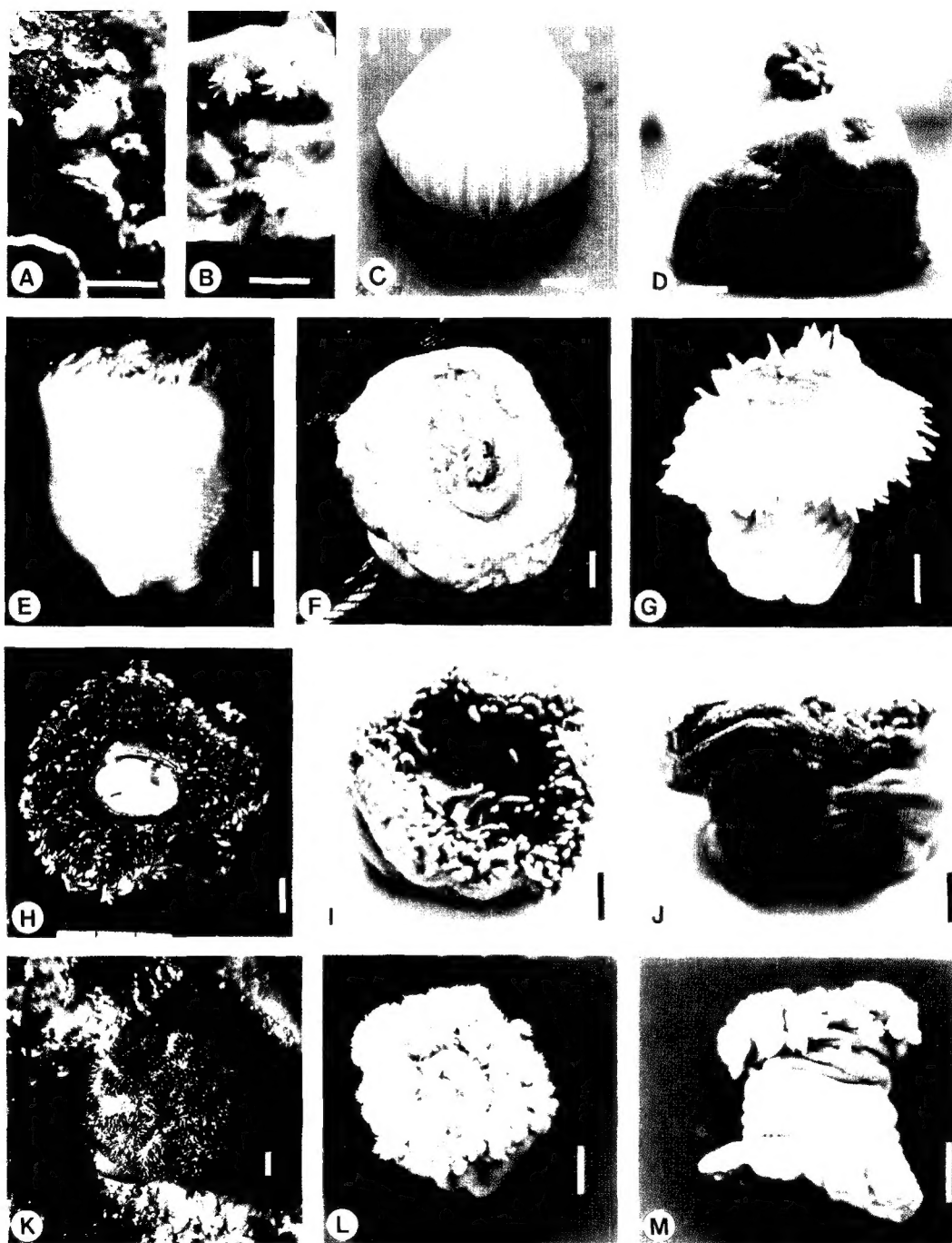
Figs. A-B. *Isanthus capensis*. A, contracted state (in life); B, expanded state.

Figs. C-D. *Stomphia coccinea*. C, contracted state; D, contracted state.

Figs. E-G. *Actinostola carlgreni*. E, expanded state (in life); F, oral part (in life); G, expanded state.

Figs. H-J. *Parasicyonis actinostoloides*. H, oral disc and tentacles (in life); I, expanded state; J, column part.

Figs. K-M. *Metridium senile*. K, expanded state (in life); L, oral part; M, expanded state.



한국산 중근아족과 창사아족 (산호충강, 해변말미잘목)의 분류

차 하 림 · 송 준 임

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요 약

한국산 산호충류의 분류학적 연구의 일환으로 1968년부터 2000년까지 삼면해역과 인근 도서지방에서 채집되어진 해변말미잘류 중 중근아족과 창사아족을 동정 및 분류하였다. 그 결과 8과 10속 11종이 밝혀졌으며, 이 중 유사말미잘 (*Isanthus capensis*), 빛말미잘 (*Actinostola carlgreni*), 풍선말미잘 (*Stomphia coccinea*), 호리병말미잘 (*Parasicyonis actinostoloides*) 및 섬유세닐말미잘 (*Metridium senile*)의 5종은 한국미기록종으로 밝혀졌다.